

(April 5, 2004)

Precast Concrete Panel Faced Structural Earth Wall Materials

General Materials

Concrete Leveling Pad

Leveling pad concrete shall be commercial concrete in accordance with Section 6-02.3(2)B.

Backfill for Precast Concrete Panel Faced Structural Earth Wall

All backfill material within the structural earth wall reinforced zone shall be free draining, free from organic or otherwise deleterious material.

Backfill material within the reinforced zone shall conform to Section 9-03.14(1), except that the maximum particle size for walls with geogrid reinforcement shall not exceed 31.5 mm.

All material within the structural earth wall reinforced zone shall be substantially free of shale or other soft, poor durability particles, and shall not contain recycled materials, such as glass, shredded tires, portland cement concrete rubble, or asphaltic concrete rubble. The material shall meet the following aggregate durability requirements:

<u>Property</u>	<u>Test Method</u>	<u>Allowable Test Value</u>
Los Angeles Wear, 500 rev.	AASHTO T 96	35 percent max.
Degradation	WSDOT Test Method 113	15 percent min.

For walls with metallic soil reinforcement, all material within the structural earth wall reinforced zone shall meet the following chemical requirements:

<u>Property</u>	<u>Test Method</u>	<u>Allowable Test Value</u>
Resistivity	AASHTO T 288	3,000 ohm-cm, min.
pH	AASHTO T 289	5 to 10
Chlorides	AASHTO T 291	100 ppm max.
Sulfates	AASHTO T 290	200 ppm max.

If the resistivity of the backfill material equals or exceeds 5,000 ohm-cm, the specified chloride and sulfate limits may be waived.

For walls with geogrid soil reinforcement, all material within the structural earth wall reinforced zone shall meet the following chemical requirements:

<u>Property</u>	<u>Test Method</u>	<u>Allowable Test Value</u>
pH	AASHTO T 289	4.5 to 9

Wall backfill material satisfying these gradation, durability, and chemical requirements shall be classified as nonaggressive.

Proprietary Materials

ARES Wall

Geogrid reinforcement shall conform to Section 9-33.1 and shall be the following products conforming to the specified material properties:

Geogrid Product Name	Wide Width Tensile Strength	^{1,2}Long Term Tensile Strength, T_{al}
Tensar UX1600HS	131 kN/m	38.5 kN/m
Tensar UX1700HS	158 kN/m	47.9 kN/m

¹These long term tensile strength requirements apply only in the geogrid direction perpendicular to the wall face.

² T_{al} shall be determined in accordance with WSDOT Test Method 925, "Determination of Long-Term Strength for Geosynthetic Reinforcement".

The wide width tensile strength of the geogrid shall be an average roll value (the average test results for any sampled roll in a lot shall meet or exceed the values shown in the table). The strength shall be determined in accordance with ASTM D 4595 or GRI:GG1, modified to address geogrids as follows:

The minimum specimen width shall be 200 mm with a minimum gauge length of 200 mm. The gauge length shall be a minimum of two grid apertures (three junctions) long. The gauge length shall be in increments of whole grid apertures. For the purpose of calculating tensile strength, the specimen width shall be considered to be the distance between the outermost ribs of the specimen as measured at the midpoint of those ribs plus the average center to center spacing between ribs. When testing under GRI:GG1, the Contractor shall conduct the test at ten percent per minute based on the gauge length specified above.

The geogrid joint strength determined in accordance with Geosynthetic Research Institute test method GRI:GG2 in the direction of loading (e.g., perpendicular to the wall face) shall be greater than or equal to 80 percent of the ultimate strength (T_{ult}) of the grid element to which they are attached. For this determination, T_{ult} shall be established using Geosynthetic Research Institute test method GRI:GG1.

The ultraviolet (UV) radiation stability, ASTM D 4355, shall be a minimum of 70 percent strength retained after 400 hours in the weatherometer.

The Engineer will take random samples of the geogrid materials at the job site. Approval of the geogrid materials will be based on testing of samples from each lot. A "lot" shall be defined as all geogrid rolls sent to the project site produced by the same manufacturer during a continuous period of production at the same manufacturing plant having the same product name. The Contracting Agency will require 14 calendar days maximum for testing the samples after their arrival at the WSDOT Materials Laboratory in Tumwater, WA.

The geogrid samples will be tested for conformance to the specified material properties. If the test results indicate that the geogrid lot does not meet the specified properties, the roll or rolls which were samples will be rejected. Two additional rolls for each roll tested which failed from the lot previously tested will then be selected at random by the Engineer for sampling and retesting. If the retesting shows that any of the additional rolls tested do not meet the

1 specified properties, the entire lot will be rejected. If the test results from all
2 the rolls retested meet the specified properties, the entire lot minus the roll(s)
3 which failed will be accepted.
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5 All geogrid materials which have defects, deterioration, or damage, as
6 determined by the Engineer, will be rejected. All rejected geogrid materials
7 shall be replaced at no expense to the Contracting Agency.
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9 Except as otherwise noted, geogrid identification, storage and handling shall
10 conform to the requirements specified in Section 2-12.2. The geogrid
11 materials shall not be exposed to temperatures less than -29C and greater
12 than 50C.
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14 Rubber bearing pads shall be a type and grade as recommended by Tensar
15 Earth Technologies, Inc.
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17 Geosynthetic joint cover for all horizontal and vertical joints shall be a non-
18 woven geosynthetic as recommended by Tensar Earth Technologies, Inc.
19 Adhesive used to attach the geosynthetic to the rear of the precast concrete
20 facing panel shall be as recommended by Tensar Earth Technologies, Inc.
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22 **MSE Plus Wall**
23 Pins connecting the reinforcing mesh to the precast concrete panels shall
24 conform to AASHTO M 32 and shall be galvanized in accordance with
25 AASHTO M 111. Damage to the galvanizing shall be repaired with one coat of
26 Formula A-9-73 paint conforming to Section 9-08.2.
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28 Bearing pads shall be serrated high-density polyethylene (HDPE) copolymer
29 pads with a Shore Hardness between 55 and 65.
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31 Filter fabric joint cover for all horizontal and vertical joints shall be non-woven
32 geosynthetic conforming to AASTHO M 288. Adhesive used to attach the
33 geosynthetic to the rear of the precast concrete facing panel shall be as
34 recommended by SSL, LLC.
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36 **Reinforced Earth Wall**
37 Reinforcing strips shall be shop fabricated from hot rolled steel conforming to
38 ASTM A 572M Grade 450 or approved equal, and shall be galvanized after
39 fabrication in accordance with AASHTO M 111. Damage to the galvanizing
40 shall be repaired with one coat of Formula A-9-73 paint conforming to Section
41 9-08.2.
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43 Bolts and nuts shall conform to Section 9-06.5(3), and shall be galvanized in
44 accordance with AASHTO M 232.
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46 Rubber bearing pads shall be a type and grade as recommended by the
47 Reinforced Earth Company.
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49 Vertical joint filler between panels, when specified in the structural earth wall
50 working drawings, shall be 50 millimeters square, flexible open cell polyether
51 foam strips, Grade UU-34, as recommended by the Reinforced Earth
52 Company.

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Filter fabric joint cover for all horizontal and vertical joints, when specified in the structural earth wall working drawings, shall be a pervious woven polypropylene filter fabric as recommended by the Reinforced Earth Company. Adhesive used to attach the fabric material to the rear of the precast concrete facing panel shall be as recommended by the Reinforced Earth Company.

Reinforced Soil Wall

Reinforcing mesh shall be shop fabricated of cold drawn steel wire conforming to AASHTO M 32, and shall be welded into finished mesh fabric conforming to AASHTO M 55. Reinforcing mesh shall be galvanized after fabrication in accordance with AASHTO M 111. Damage to the galvanizing shall be repaired with one coat of Formula A-9-73 paint conforming to Section 9-08.2.

Retained Earth Wall

Tie strips shall be shop fabricated from hot rolled steel conforming to ASTM A 570M Grade 345 or approved equal, and shall be galvanized after fabrication in accordance with AASHTO M 111. Damage to the galvanizing shall be repaired with one coat of Formula A-9-73 paint conforming to Section 9-08.2.

The embed loops and connector bars shall be fabricated of steel wire conforming to AASHTO M 32, and shall be galvanized after fabrication in accordance with AASHTO M 111.

Filter fabric joint cover for all horizontal and inclined joints shall be a monofilament filter fabric as recommended by Foster Geotechnical. Adhesive used to attach the fabric to the rear of the precast concrete facing panel shall be as recommended by Foster Geotechnical.